2001 Annual Compliance Report
Falls City, Texas, Disposal Site

Compliance Summary

The site, inspected on January 9, 2001, was in excellent condition. Scattered small trees and bushes continue to colonize the side slopes of the disposal cell and require control. Results of ground-water monitoring were consistent with results from previous years and indicate essentially steady-state conditions. Ground water became more acidic (pH decreased) at two wells, but the decrease has been gradual since baseline data were established in the early 1990s. Nothing in the data, such as a sharp or sudden decrease in pH, suggests an increase in leaching from the disposal cell or significant changes to legacy plumes in the underlying aquifers. Other than ongoing management of the grass and side slope vegetation, inspectors identified no requirement for additional maintenance or a follow-up inspection.

Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Falls City, Texas, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I disposal site are specified in the *Long-Term Surveillance Plan for the Falls City, Texas, Disposal Site* (DOE/AL/62350–187, Rev. 3, U.S. Department of Energy [DOE], Albuquerque Operations Office, July 1997) and in procedures established by the DOE Grand Junction Office to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 5–1. Additional ground water monitoring began in accordance with the Ground Water Compliance Action Plan, which received concurrence of the U.S. Nuclear Regulatory Commission on September 18, 1998. Provisions of the Ground Water Compliance Action Plan will be incorporated into the Long-Term Surveillance Plan.

Table 5–1. License Requirements for the Falls City, Texas, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 6.0 and 10.0	Section 1.0
Follow-up or Contingency Inspections	Section 7.0	Section 2.0
Routine Maintenance and Repairs	Section 8.0	Section 3.0
Ground-Water Monitoring	Section 5.0, pages 5–1, 5–20, 5–23 through 5–25, and the GCAP[a]	Section 4.0
Corrective Action	Section 5.0, pages 5–25 and 5–26, and Section 9.0	Section 5.0

[a]Ground Water Compliance Action Plan dated March 19, 1998

Compliance Review

1.0 Annual Site Inspection and Report

The site, east of Falls City, Texas, was inspected on January 9, 2001. Results of the inspection are described below. Features and photo locations (PLs)mentioned in this report are shown on Figure 5–1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

1.1 Specific Site Surveillance Features

Access Road, Entrance Gate, Fence, and Signs—The entrance gate, entrance sign, and all 64 perimeter signs along the site boundary were in excellent condition. The fence is in good condition; minor repairs were made. Vandalism of signs, a problem in the past, did not occur this year.

Site Markers and Monuments—The two site markers, three survey monuments, and two boundary monuments were in excellent condition.

Monitor Wells—All monitor wells in the monitoring network were in excellent condition. The monitoring network now includes five wells specified in the Ground Water Compliance Action Plan, in addition to the seven wells identified in the Long-Term Surveillance Plan for cell
5A performance monitoring. All other wells were decommissioned in 2001.

1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three areas referred to as transects: (1) the top and side slopes of the disposal cell; (2) the site perimeter; and (3) the outlying area. Inspectors examined each transect for evidence of erosion, settling, slumping, or other phenomena that might affect site integrity or the long-term performance of the site.

Top and Side Slopes of the Disposal Cell—The top of the disposal cell is covered with well-established coastal Bermuda grass. Small percentages of Kleingrass and other species are interspersed. The grass is cut, bailed, and removed 2 to 3 times a year depending on rainfall. Cutting and bailing is contracted to a local rancher.

5B Along the edge at the top of the disposal cell, there is an occasional small bush or tree that is missed by the mower. This vegetation is cut or treated with herbicide on an annual or as needed basis.

Small trees and bushes have been establishing for several years on the side slopes of the disposal cell (PL–1). Some, like greasewood and palo verde, are deep rooted. The plants give the disposal cell an unkempt appearance. DOE retained a local contractor to remove vegetation from the side slopes on an ongoing basis. Control measures are performed annually or as needed.

The side slopes of the disposal cell are armored with riprap, which overall is in excellent condition. Over the last 2 years, inspectors have noted that a very small percentage (less than 1 percent) of the riprap is cracked or broken (PL–2). It is not clear whether the cracks are recent or just recently noticed. None of the broken pieces appear to be more weathered or less durable than the unbroken rocks. Current assessment is that cracks are the result of stresses induced in the rock during quarrying and are not caused by chemical or physical weathering. Although inspectors will continue to note the condition of the rock, further cracking or breaking of the rock is not expected.

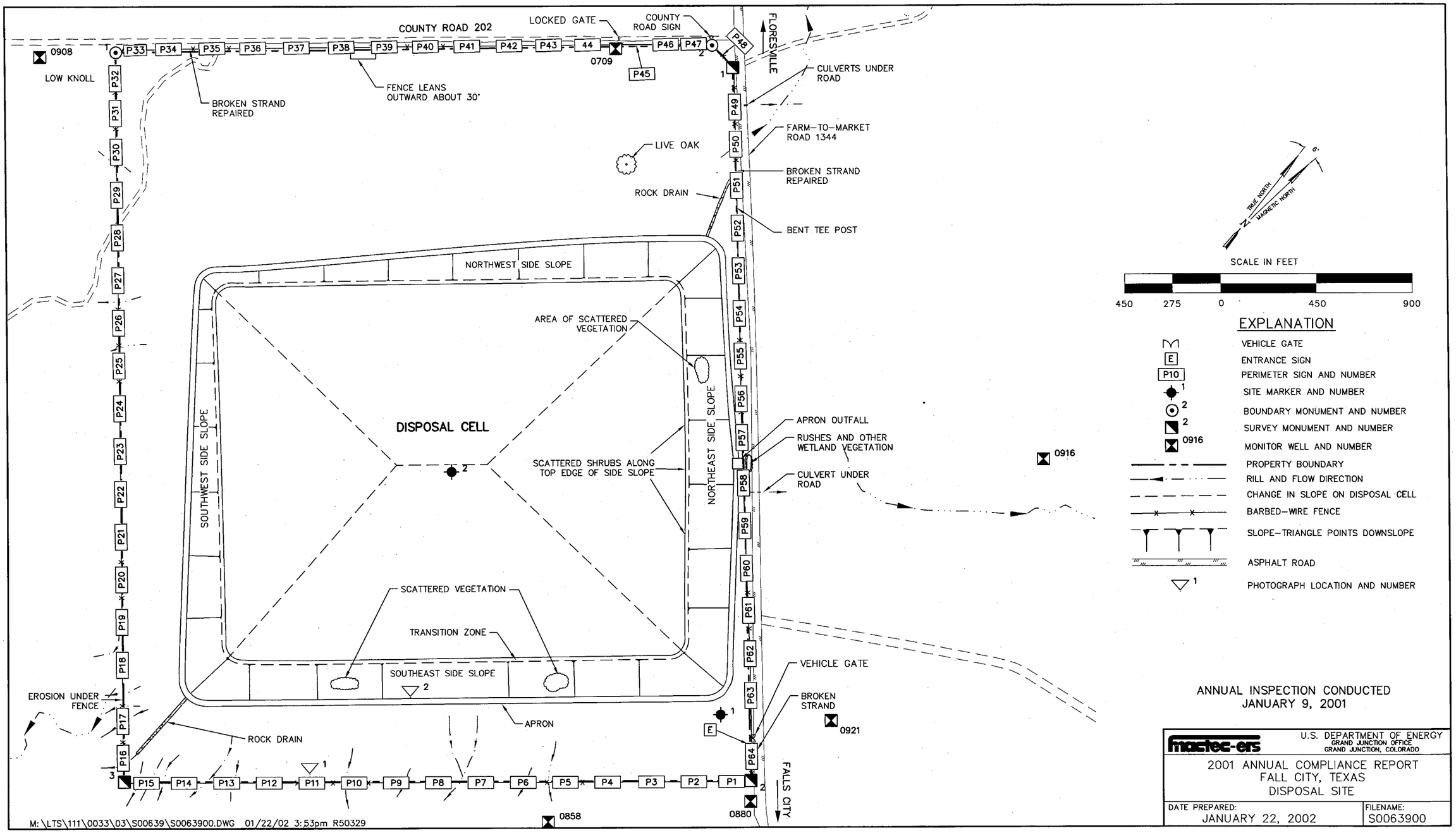

Figure 5–1. 2001 Compliance Drawing for the Falls City, Texas, Disposal Site

Site Perimeter—The area between the toe of the disposal cell and the perimeter fence is covered with well-established grass, primarily Kleingrass but with some coastal Bermuda grass as well. Rill and gully erosion noted in the early 1990s, soon after completion of remedial action, is now stabilized with the successful establishment of this grass.

As on the top of the disposal cell, grass in the perimeter transect is managed by cutting, baling, and removal. For practical reasons, a swath of uncut grass is usually left along the fence and around rock drains and other as-built features. The grass along the fence was burned this year to reduce fire danger.

Except for one mature oak tree north of the disposal cell that was saved during remedial action, there are no trees in the perimeter transect where the grass is cut. Grass cutting appears to be an effective control of these plants.

5B As noted previously, grass is growing in the north and south rock drains. The apron outfall, midway along the northeast side slope, is not yet affected. The rock drains appear to function properly in spite of the grass. The grass may enhance performance of the rock drains by dissipating energy or velocity of runoff.

The stock fence around the site is in good condition. Along the northwest boundary, the fence leans outward above a steep bank, but seems stable in this position and is sufficient to keep cattle and casual intruders out. The fence is aging but serviceable. Broken strands of wire were repaired in 2001.

Outlying Area—The area outward for a distance of 0.25 mile from the site boundary was visually inspected. No erosion, development, or other disturbance was seen.

In spring 1999, the U.S. National Resource Conservation Service replaced terraces and filled gullies on state-owned land southeast of the site. The terraces were removed during remedial action and caused flooding on adjacent private property. Inspectors noted that the terraces and grading appeared to be in good condition. During a ground-water sampling trip in April, terrace revegetation efforts appeared to be successful.

2.0 Follow-Up or Contingency Inspections

No follow-up or contingency inspections were required in 2001.

3.0 Routine Maintenance and Repairs

5C Minor fence repairs, ongoing management of the grass, and control of trees and bushes growing on the disposal cell were required in 2001.

4.0 Ground-Water Monitoring

5D DOE monitors ground water at the Falls City site for two purposes. Ground water is monitored in the uppermost aquifer (for a limited time), as a best management practice, to demonstrate the initial performance of the disposal cell. DOE also monitors ground water downgradient of legacy plumes of contaminated ground water to ensure that users are not exposed to processing-related hazardous materials. Monitor well networks and contaminant plumes are shown on Figure 5–2.

Cell Performance Monitoring—The cell performance monitoring network consists of seven wells completed in the Conquista and Deweesville sandstone units, which together constitute the uppermost aquifer. Wells 0908 and 0916 in the unsaturated zone of the Conquista Sandstone are dry and have never produced samples. These wells are used only to detect a rise in the water table. These seven wells are sampled twice each year.

As stipulated in the original Long-Term Surveillance Plan, samples are analyzed for 10 analytes, all with maximum concentration limits established by the U.S. Environmental Protection Agency in 40 CFR 192, Table 1 of Subpart A. Table 5–2 lists the 10 analytes and their standards.

Table 5–2. Cell Performance Analytes and Standards for the Falls City, Texas, Disposal Site

Analyte	MCL[a]	Analyte	MCL[a]
Arsenic	0.05 mg/L	Nitrate (as N)	10 mg/L[b]
Cadmium	0.01 mg/L	Selenium	0.01 mg/L
Chromium	0.05 mg/L	Uranium	0.044 mg/L
Lead	0.05 mg/L	Radium-226+228	5 pCi/L
Molybdenum	0.1 mg/L	Gross alpha	15 pCi/L

Note: mg/L = milligrams per liter; pCi/L = picocuries per liter
[a]MCL = Maximum concentration limit established in 40 CFR 192.
[b]The standard of 10 mg/L for nitrate as N is equivalent to a concentration of 44 mg/L for nitrate as NO_3. Nitrate as NO_3 is the analyte measured for this site.

Monitoring for these analytes is now understood to be an ineffective and inappropriate means to monitor the initial performance of the disposal cell. Ground water at the site is in contact with naturally occurring uranium deposits and associated minerals. Water that might leach from the disposal cell, either through transient drainage or percolation of precipitation through the cover, will be chemically similar and perhaps indistinguishable from naturally occurring ground water contaminated by minerals and human activities (mining, milling, and mineral exploration).

The Long-Term Surveillance Plan identifies pH as the indicator parameter for cell performance monitoring. However, legacy plumes typified by low pH exist beneath the cell in a ground water mound created by infiltration from historical tailings impoundments and mill effluent discharges. These plumes would be expected to spread outward as the ground water seeks an equilibrium level; however, buffering mechanisms caused by interaction of low pH waters and formation materials are expected to limit plume extent.

The pH of the ground-water samples collected in 2000 and 2001 was essentially unchanged and consistent with previous results for all wells except 0858 and 0880. Seasonal variation in pH continued to be noticeable at most wells. The pH tends to be higher (more neutral) in fall and lower (more acidic) in spring. This seasonal variation was in all cases less than 0.5 standard pH units during 2000 and 2001.

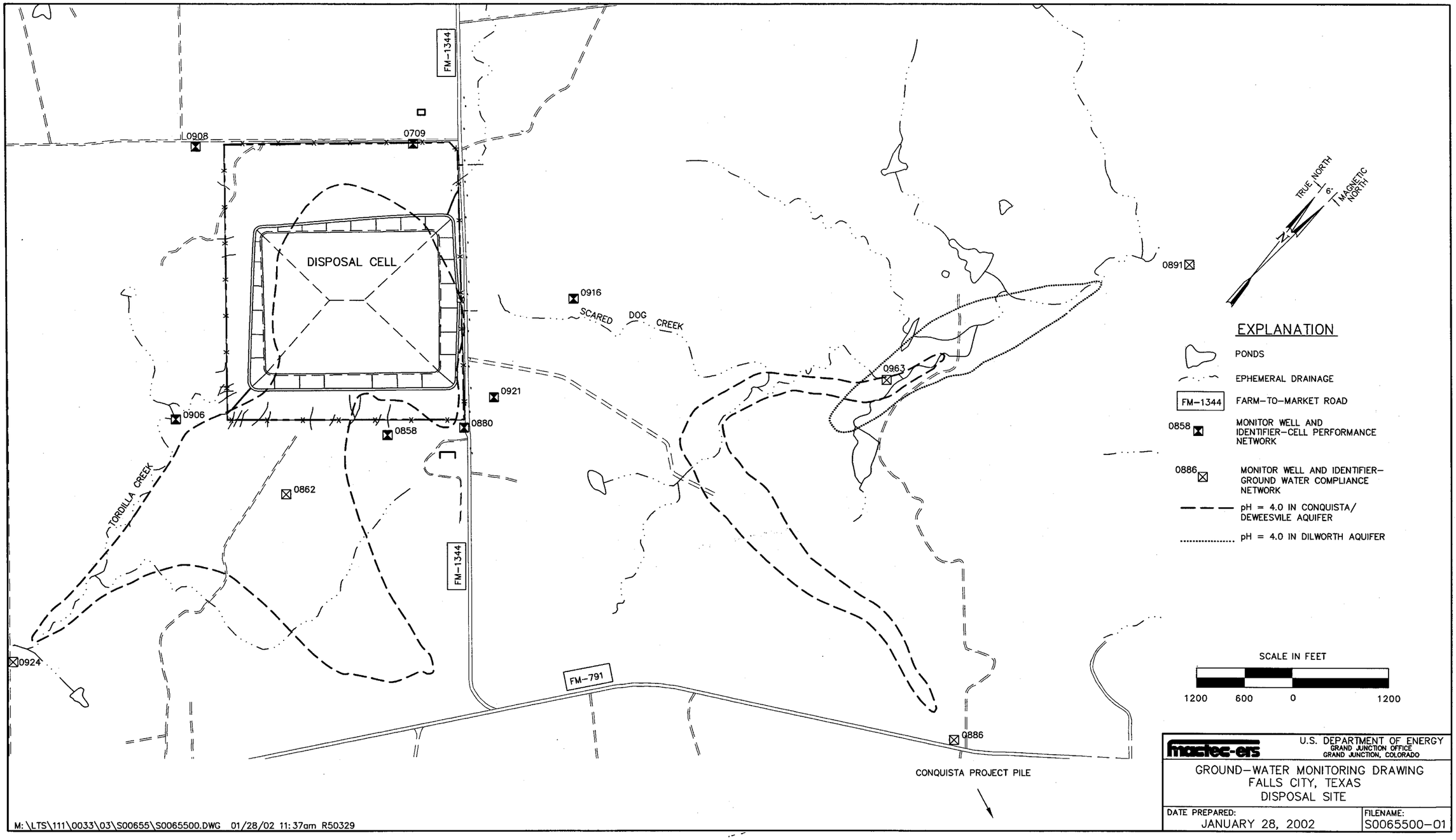

Figure 5–2. Ground-Water Monitoring, Falls City, Texas, Disposal Site

Ground-water pH at monitor wells 0858 and 0880 has decreased gradually since baseline data were collected. The reason for the decrease is unclear. The decrease may be the result of dissipation of the pre-existing ground water mound and the consequent outward movement of the low-pH plume. Transient drainage from the cell may be contributing low pH fluids to the aquifer. Clearly, nothing in the data, such as a sharp or sudden decrease in pH, suggests excessive leaching from the disposal cell.

Analytical results from 2001 are consistent with previous years' results and what would be expected of ground water contaminated by uranium mineralization. Of the 10 analytes, concentrations of 6 continue to exceed their respective standards, and this is essentially unchanged since the Long-Term Surveillance and Maintenance Program began cell performance monitoring in 1997. These results, summarized in Table 5–3, indicate an essentially steady-state condition.

Table 5–3. Cell Performance Monitoring Analytical Results for 2001 for the Falls City, Texas, Disposal Site

Analyte	Monitor Well Where Concentration Exceeds Standard
Arsenic	0880
Cadmium	0880, 0906, 0921
Selenium	0709, 0858, 0880, 0906, 0921
Uranium	0709, 0880, 0906, 0921
Radium-226+228	0709, 0858, 0880, 0906
Gross alpha	0709, 0880, 0906, 0921

Note: Wells producing samples were 0709, 0858, 0880, 0906, and 0921.

Water level measurements from monitor wells 0709, 0858, 0880, and 0921 indicate that, in general, the elevation of the water table has dropped between 4 feet and 9 feet since the disposal cell was constructed. The water table at well 0906 has been more variable, with periods of falling and rising water levels since that time and no apparent trend.

The water level data indicate that the falling water table in the vicinity of the cell is probably not part of a regional trend but is instead a local effect due to dissipation of the ground water mound beneath the disposal cell.

Monitor well 0906 is located a greater distance from the cell and apparently is influenced by discharge and recharge to Tordilla Creek; therefore, the water table at this location may be influenced more by local hydrogeological conditions than by the mounding of water beneath the disposal cell.

Ground-Water Compliance Monitoring—The U.S. Nuclear Regulatory Commission approved the Ground Water Compliance Action Plan for the Falls City site in 1998, and DOE began a program of ground water compliance monitoring. Beginning in 2001, the Long-Term Surveillance and Maintenance Program assumed responsibility for monitoring downgradient of the legacy plumes of contaminated ground water, as required by the Ground Water Compliance Action Plan, which stipulates that this monitoring will continue through 2003.

5E

Two plumes are identified (see Figure 5–2). The east plume affects the Conquista/Deweesville aquifer and the underlying Dilworth aquifer. The west plume, underlying the cell, also affects the

Conquista/Deweesville aquifer, although elevated concentrations of some analytes had historically been observed in the Dilworth aquifer at well 0862.

The compliance monitoring network consists of five wells: 0862, 0886, 0891, 0924, and 0963. Sample locations were selected on the basis of ground-water flow direction from the two plumes. The wells are sampled annually and analyzed for 33 analytes, of which 10 have a standard specified in 40 CFR 192, Table 1 of Subpart A (Table 5–2). Results for analytes that exceeded the standard are summarized in Table 5–4.

Table 5–4. Ground-Water Compliance Monitoring Analytical Results for 2001 for the Falls City, Texas, Disposal Site

Analyte (units)	Monitor Well Where Analyte Concentration Exceeded Standard	Zone of Completion[a] and Plume	Result
Cadmium (mg/L)	0886	D/C-west	0.0226
	0963	D/C-east	0.0196
Selenium (mg/L)	0886	D/C-west	0.0513
Uranium (mg/L)	0924	D/C-west	0.324
	0963	D/C-east	0.0934
Radium-226+228 (pCi/L)	0886	D/C-west	24.20
Gross alpha (pCi/L)	0886	D/C-west	57.27
	0924	D/C-west	150.28
	0963	D/C-east	78.11

[a]D/C = Deweesville/Conquista aquifer

Analyte concentrations at most locations remained essentially constant. However, at well 0886, pH has decreased approximately one standard unit over the past 3 years, from 5.5 to 4.4. This decrease has been accompanied by increases in concentrations of cadmium, nitrate, and selenium. Historically, pH at well 0886 has ranged from 3.9 to 5.5, and metals concentrations have changed inversely with changes in pH. Changes in ground-water chemistry at this location might reflect varying degrees of dilution by uncontaminated water and natural buffering by formation materials that will raise pH. This portion of the east plume has extended toward the Conquista Project tailings disposal site, and no ground-water use was identified downgradient from well 0886. However, this plume is not expected to migrate farther but rather to be attenuated by natural processes.

Ground-water levels at the compliance monitoring locations have remained essentially constant since monitoring began. Minor fluctuations in water level are likely caused by seasonal factors affecting recharge rates. Well 0924, completed in the Conquista/Deweesville aquifer, is beyond the influence of the ground-water mound underlying the disposal cell.

5.0 Corrective Action

Corrective action is action taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2001.

6.0 Photographs

Table 5–5. Photographs Taken at the Falls City, Texas, Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	0	Reference Photograph of Vegetation on Southeast Side Slope
PL–2	315	Fractured Riprap on Southeast Side Slope

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PL–1. Reference Photograph of Vegetation on Southeast Side Slope

PL–2. Fractured Riprap on Southeast Side Slope